Public Health England

Protecting and improving the nation's health

Epidemiology of *Shigella* in adults in London, 2011 to 2015: Sustained excess of cases in men who have sex with men

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. It does this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. PHE is an operationally autonomous executive agency of the Department of Health.

Public Health England
133-155 Waterloo Road
Wellington House
London SE1 8UG
Tel: 020 7654 8000
www.gov.uk/phe
Twitter: @PHE_uk
Facebook: www.facebook.com/PublicHealthEngland

Prepared by: Jacquelyn McCormick, Piers Mook and Paul Crook, Field Epidemiology Services, South East & London.

For queries relating to this document, please contact fes.seal@phe.gov.uk

Published April 2016
PHE publications gateway number: 2016003

Contents

Executive summary

Shigella are bacteria spread by the faecal oral route which can cause bloody diarrhoea. In the past, *Shigella* infections in the UK were primarily associated with travel to low-income countries, with endemic transmission due to poor sanitation, however, in the past decade outbreaks have been documented in men who have sex with men (MSM) due to transmission during sexual activity.

Previous investigation of MSM cases in the UK has characterised cases as having high numbers of sexual partners, high levels of condomless sex, attending sex parties, sex under the influence of recreational drugs (chemsex) and high levels of HIV positivity. Recent investigation of a *S. sonnei* cluster in London has revealed low levels of awareness of *Shigella* among MSM cases.

After a sustained increase from 2011 to 2014, the number of *Shigella* cases in adults in London has decreased by 12% from 2014 (n=556) to 2015 (n=488). *S. flexneri* (53% in 2015) is the most commonly reported species, followed by *S. sonnei* (45%). Among *S. flexneri* cases, serotype 2a (78%) is the most common. The most common serotype in 2013, serotype 3a, comprised 9% of *S. flexneri* cases in 2015.

Despite the decrease in cases, there is a clear sustained excess of adult male cases which likely reflects on-going transmission in MSM within the UK. In 2015, there were over five times as many adult male cases of *Shigella* without a history of foreign travel than females and an excess of 275 *Shigella* cases in adult males (compared to adult females) without a known travel history. This represents a greater than two-fold increase from 2011 (n=96), but a 17% decrease from 2014 (n=333). The number of male *S. flexneri* 2a cases without a known history of foreign travel has continued to increase in 2015, with nearly a ten-fold increase since 2011.

Further work is needed to reduce transmission of *Shigella* in MSM. MSM need to be aware of how to avoid *Shigella* infection and of the symptoms. PHE is intending to repeat a campaign to raise awareness and it is recommended that local action is taken by commissioners and sexual health clinics to raise awareness using materials already available on the PHE website. Sexual health clinics and health protection teams managing cases should take opportunities to provide advice to cases on how to prevent spread.

Aim

The aim of this report is to update stakeholders on the epidemiology of *Shigella* in adults in London.

Context

Shigella

Shigella are gram negative bacteria that cause a highly infectious intestinal disease with symptoms ranging from watery diarrhea to bloody diarrhea, fever and abdominal pain. In certain cases, infection with *Shigella* can result in severe invasive disease and life threatening complications such as toxic megacolon and haemolytic uraemic syndrome. Mild and asymptomatic infection can also occur. Persons with mild infections usually recover quickly without antibiotic treatment and the infection can be limited by following simple hygienic measures such as frequent hand washing[1,2].

The incubation period of *Shigella* is between 12 and 96 hours and the infectious period is primarily during the diarrhoeal illness. Humans are the only significant reservoir of *Shigella* infection with transmission occurring faeco-orally through ingestion of contaminated food or water, or through close personal or sexual contact with an infected person. The infectious dose of *Shigella* is low, with possible infection following the ingestion of as few as 10 organisms. Moreover, the bacteria can survive for up to 20 days in favourable environmental conditions, enhancing the probability of transmission through contact with contaminated fomites.

Shigella sonnei, which is common in Europe and is endemic in England and Wales, is usually associated with mild illness. *Shigella boydii*, *Shigella dysenteriae* and *Shigella flexneri* have historically been usually associated with travel to developing countries and cause more severe disease[1,2].

Public health management

Shigella is a notifiable disease. Public Health England Health Protection Teams routinely follow-up all cases of *S. boydii, S. dysenteriae* and *S. flexneri* in order to identify cases and contacts in risk groups that require clearance. Advice is also given on how to prevent further spread.

Epidemiology

In the past, *Shigella* infections in adults in the UK were primarily associated with travel to low-income countries, with endemic transmission due to poor sanitation, however, there has been a change in the epidemiology of shigellosis since 2009, marked by the emergence of an outbreak of *S. flexneri* 3a in men who have sex with men (MSM), thought to be associated with sexual transmission[3,4].

The most recent national surveillance data suggest further intensification of *Shigella* transmission associated with sex between MSM has occurred since the 2009 outbreak[5]. The emergence of three distinct national outbreaks of *S. flexneri* 3a, *S. flexneri* 2a, and *S. sonnei* suggests at least three separate introductions of this pathogen into the MSM population over the past decade. These outbreaks have coincided with increased diagnoses of gonorrhoea, lymphogranuloma venereum (a form of chlamydia causing systemic infection), infectious syphilis, and a recent cluster of verotoxin-producing *Escherichia coli* 0117:H7 among MSM, particularly in those co-infected with HIV.

We have previously reported a national outbreak and investigation of *S. flexneri* 3a occurring in MSM between 2009 and 2011[6]. Most of these cases were white, UK-born MSM, many were HIV-positive, and they reported being part of dense sexual networks involving high numbers of casual and regular partners. This outbreak was associated with (i) low awareness about the risk of enteric infections, (ii) chemsex (sexual activity while under the influence of [typically] stimulant drugs), and (iii) meeting sex partners and locating sex parties through social and sexual networking applications (iv) condomless sex[6].

The use of whole genome sequencing (WGS) on *Shigella* isolates has been introduced in 2015, which has led to the identification of new clusters of genetically similar *Shigella* infections that would not otherwise be detected. In late 2015 WGS identified a number of clusters of *S. sonnei* with high proportions of adult males with no travel history which had specific antibiotic resistance profiles. Further investigation, using detailed sexual exposure questionnaires, into one of these clusters centred in London has identified a number of cases to be MSM who report a variety of high risk sexual exposures during the incubation period and low awareness of *Shigella.* The *S. sonnei* in this cluster had high levels of antimicrobial resistance (Extended-spectrum beta-lactamase (ESBL) producing) typically only seen before in *Shigella* infections associated with travel and therefore imported[7]. The potential spread of antibiotic resistance found in these clusters may have implications in the treatment of enteric pathogens in the immunocompromised.

Raising awareness

PHE conducted an awareness campaign in early 2014 with the Terence Higgins Trust, which included the production of posters and leaflets which are available via the PHE website[8]. A further campaign is planned for 2016 to improve awareness among MSM as well as among medical practitioners.

Data sources

The PHE Gastro Data Warehouse (GDW) was the only data source used to produce this report. GDW reports on samples processed at the PHE Gastrointestinal Bacteria Reference Unit (GBRU). It is known that not all positive cultures are sent to GBRU; 58% of *Shigella* samples reported by laboratories in London from 2011 to 2015 through the laboratory reporting system were also on GDW. Please see the Appendix 1 for more information on how data were analysed.

This report only includes laboratory confirmed cases of *Shigella* aged 16 to 60 years resident in London. If case residence was unknown the original reporting laboratory was used as proxy. Residence information is often missing (only 25% of cases had a valid UK postcode).

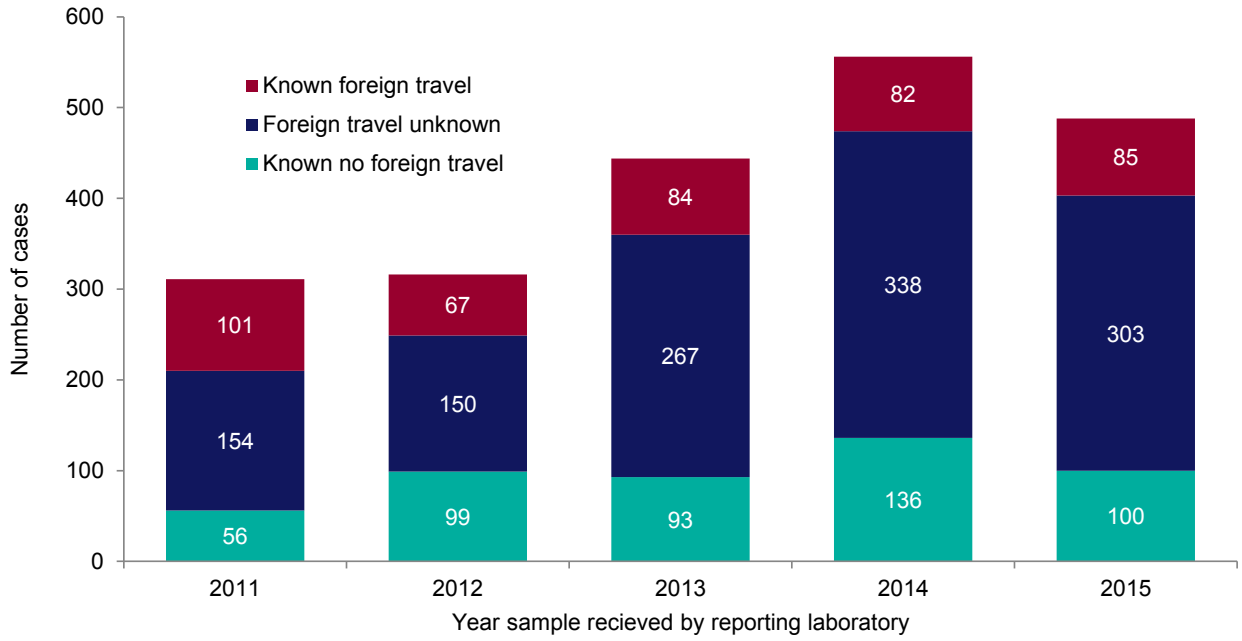
Epidemiology

All cases

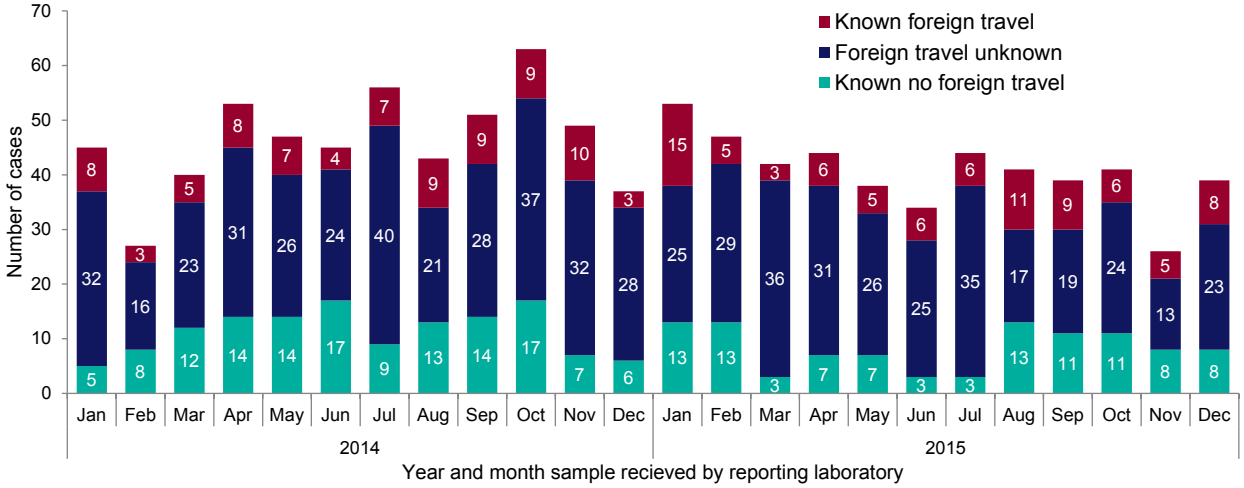
The number of *Shigella* cases in adults in London has increased by 56% between 2011 (311 cases) and 2014 (556 cases), before decreasing in 2015 (488 cases) (Figure 1).

Figure 1. Cases aged 16 to 60 years diagnosed with *Shigella* infection, by foreign travel status, London
Data source: Gastro Data Warehouse (GDW)

A) 2011 to 2015, by year



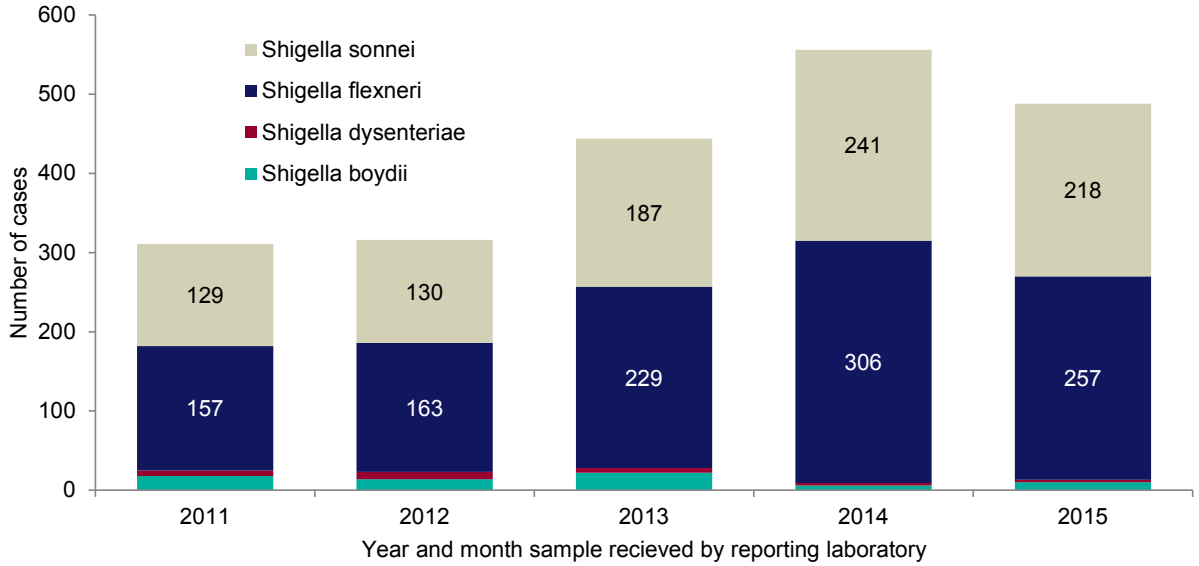
B) 2014 to 2015, by year and month



Polymerase chain reaction testing was introduced in some laboratories in 2014 and 2015; this is a more sensitive test and is therefore more likely to detect *Shigella*. This may have resulted in an increase in the number of *Shigella* cases reported in 2014.

S. flexneri was the most commonly reported species each year between 2011 and 2015 (53% in 2015), followed by *S. sonnei* (45% in 2015). The number of cases of *S. flexneri* and *S. sonnei* cases increased dramatically between 2012 and 2014 (approximately doubling) before decreasing slightly in 2015. Cases of *S. dysenteriae* and *S. boydii* were less common, representing a combined total of 5% of cases between 2011 and 2015 (Figure 2).

Figure 2. Cases aged 16 to 60 years diagnosed with *Shigella* infection, by species, London from 2011 to 2015
Data source: Gastro Data Warehouse (GDW)



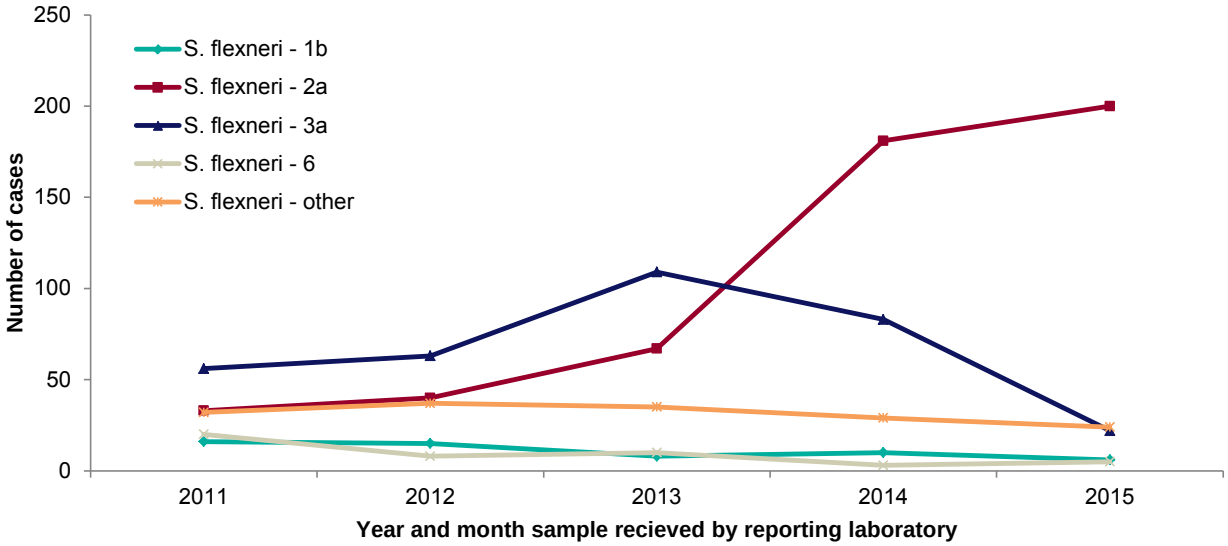
Foreign travel

The travel status of 57% cases from 2011 to 2015 is not explicitly known which hampers the ability to interpret trends. The proportion of cases where travel status is unknown increased from 49% in 2011 to 2012 to 61% from 2013-2015. The number of *Shigella* cases known to be associated with foreign travel reduced by 16% from 101 cases in 2011 to 85 cases in 2015; no distinct trend can be seen in the data (Figure 1).

No known history of foreign travel

The number of cases without a known history of foreign travel increased dramatically between 2011 (210 cases) and 2015 (403 cases) (Figure 1). Among *S. flexneri* cases, serotype 2a (n=200, 78%) remains the most common serotype reported in 2015, after overtaking 3a in 2014. (Figure 3).

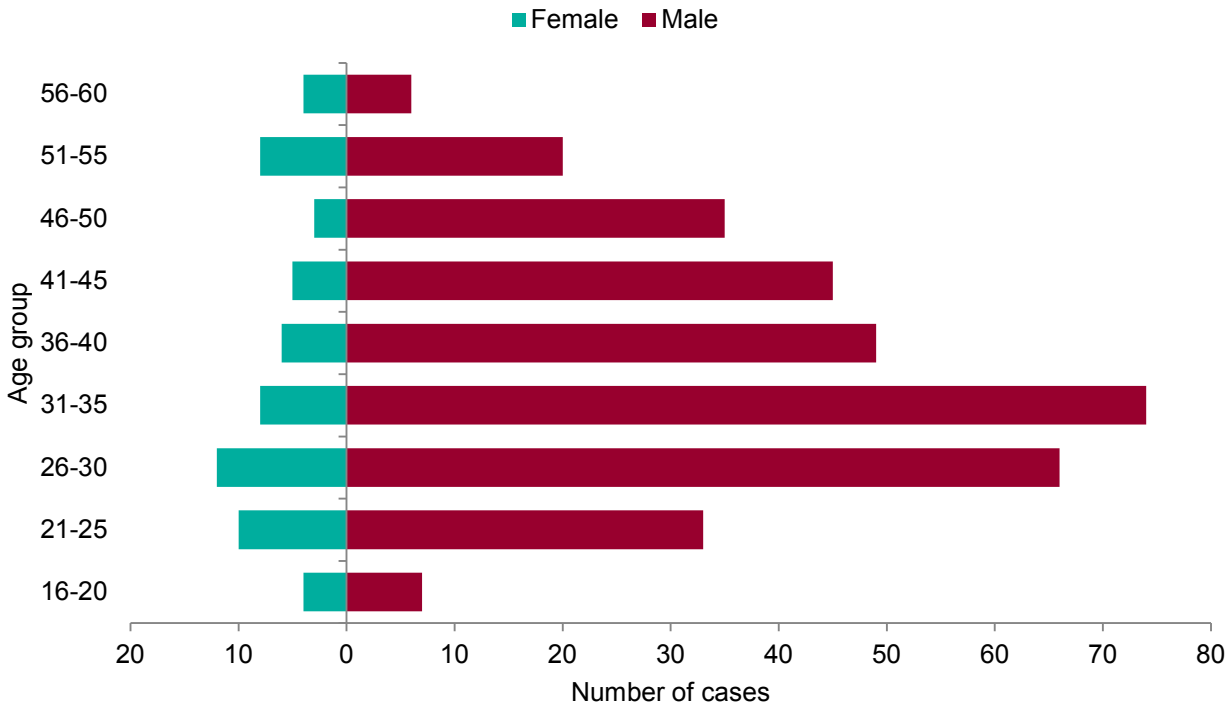
Figure 3. Cases aged 16 to 60 years diagnosed with *Shigella flexneri*, no known history of travel outside the UK, by serotype, London, 2011 to 2015
Data source: Gastro Data Warehouse (GDW)



Excess of adult males without a known history of foreign travel

In 2015 the highest number of cases of *Shigella* in those without a known history of foreign travel was seen in adult males aged 26 to 35 years (Figure 4).

Figure 4. Age and sex distribution of cases aged 16 to 60 years diagnosed with *Shigella* infection, with no known history of travel outside the UK, London, 2015
Data source: Gastro Data Warehouse (GDW)



There is a clear excess of adult male cases of *Shigella* in those without a known history of foreign travel;

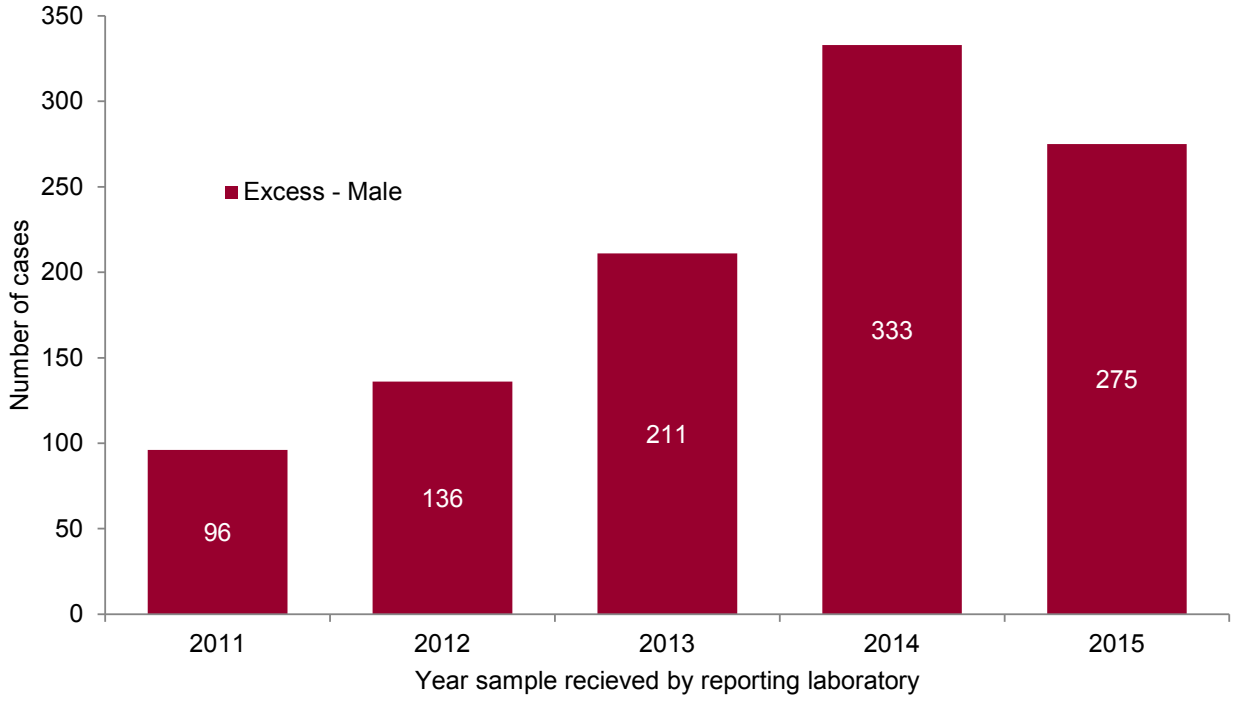
- in 2015 there were 275 excess adult male cases of *Shigella* (compared to females), nearly a than a three-fold increase from 2011 (n=96), but lower than 2014 (n=333) (Figure 5)

- the proportion of cases that are male has increased between 2011 (77%) to 2015 (85%) (Table 1)

- the ratio of male to female cases increased between 2011 (2.8:1 male to female cases) and 2015 (5.6:1) (Table 1)

- After an increase from 2011 to 2014, the number of excess male cases decreased by 17% from 2014 (333 cases) to 2015 (275 cases)

Figure 5. Excess male cases aged 16 to 60 years diagnosed with *Shigella* with no known history of travel outside the UK, by sex, London, 2011 to 2015
Data source: Gastro Data Warehouse (GDW)



The most notable recent increases in adult male cases without a known history of foreign travel has been in S. flexneri 2a and S. sonnei cases; increasing approximately ten-fold and two-fold respectively between 2011 and 2015 (Figure 6). In 2015, there was an excess of 165 S. flexneri 2a, 88 S. sonnei and 19 S. flexneri 3a in adult males (compared to females) (Table 1; Figure 7). The ratio of male to female S. flexneri 2a and S. flexneri 3a was particularly high in 2015 (18:1 and 20:0 respectively) (Table 1). After a 50% increase in male S. flexneri 3a from 2011 to 2013, the number of S. flexneri 3a cases decreased by approximately 78% between 2013 and 2015.

Table 1. Sex ratio and excess male cases aged 16 to 60 years diagnosed with *Shigella* infection, with no known history of travel outside the UK, where sex is known, London, 2011 to 2015, sex ratios greater than 2.0 shaded red[1]

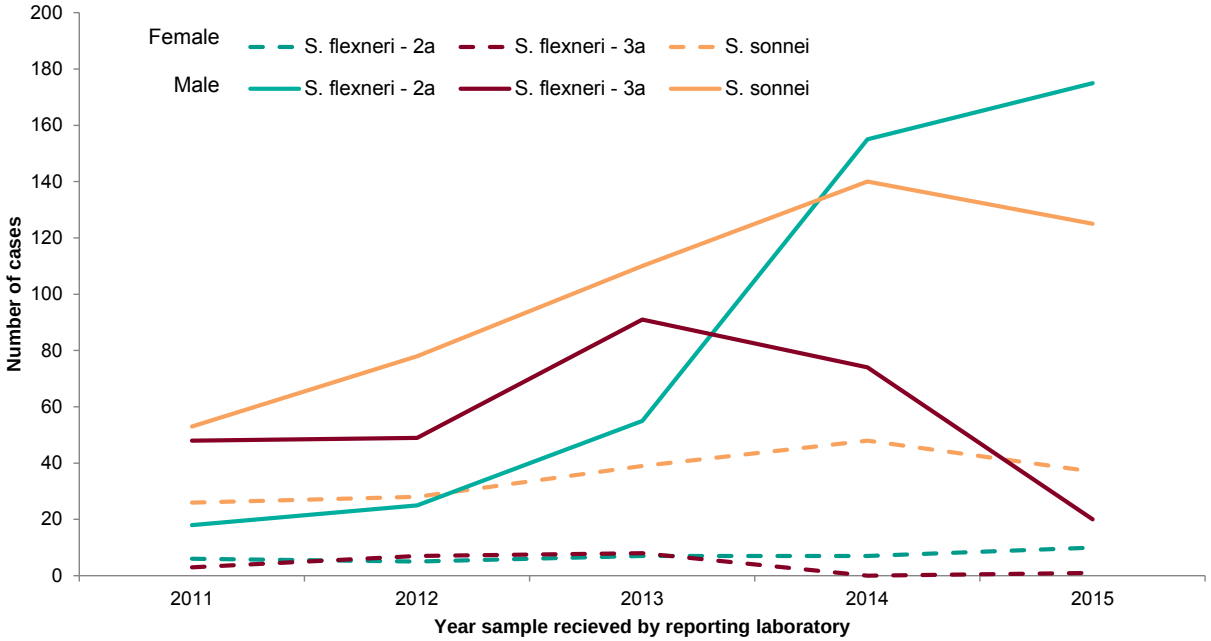
Data source: Gastro Data Warehouse (GDW)

Shigella species	Serotype	Sex, sex ratio, excess male cases	2011	2012	2013	2014	2015	Total
S. flexneri	1b	Male	6	7	3	5	0	21
		Female	3	3	3	2	3	14
		Ratio	2.0	2.3	1.0	2.5	0.0	1.5
		Excess male	3	4	0	3	-3	7
	2a	Male	18	25	55	155	175	428
		Female	6	5	7	7	10	35
		Ratio	3.0	5.0	7.9	22.1	17.5	12.2
		Excess male	12	20	48	148	165	393
	3a	Male	48	49	91	74	20	282
		Female	3	7	8	0	1	19
		Ratio	16.0	7.0	11.4	∞	20.0	14.8
		Excess male	45	42	83	74	19	263
	6	Male	4	3	1	1	1	10
		Female	6	3	2	0	0	11
		Ratio	0.7	1.0	0.5	∞	∞	0.9
		Excess male	-2	0	-1	1	1	-1
	Other	Male	20	26	18	20	11	95
		Female	5	4	8	3	5	25
		Ratio	4.0	6.5	2.3	6.7	2.2	3.8
		Excess male	15	22	10	17	6	70
S. sonnei	NA	Male	53	78	110	140	125	506
		Female	26	28	39	48	37	178
		Ratio	2.0	2.8	2.8	2.9	3.4	2.8
		Excess male	27	50	71	92	88	328
S. boydii	NA	Male	1	1	6	2	3	13
		Female	5	4	5	3	3	20
		Ratio	0.2	0.3	1.2	0.7	1.0	0.7
		Excess male	-4	-3	1	-1	0	-7
S. dysenteriae	NA	Male	0	3	0	0	0	3
		Female	0	2	1	1	1	5
		Ratio	-	1.5	0.0	0.0	0.0	0.6
		Excess male	0	1	-1	-1	-1	-2
All	NA	Male	150	192	284	397	335	1358
		Female	54	56	73	64	60	307
		Ratio	2.8	3.4	3.9	6.2	5.6	4.4
		Excess male	96	136	211	333	275	1051

[1] Sex ratio is the ratio of male to female cases, excess male cases is the difference between the number of male and female cases.

Figure 6. Cases aged 16 to 60 years diagnosed with *Shigella flexneri* serotypes 2a and 3a and *Shigella sonnei*, with no known history of travel outside the UK, by sex, London, 2011 to 2015

Data source: Gastro Data Warehouse (GDW)

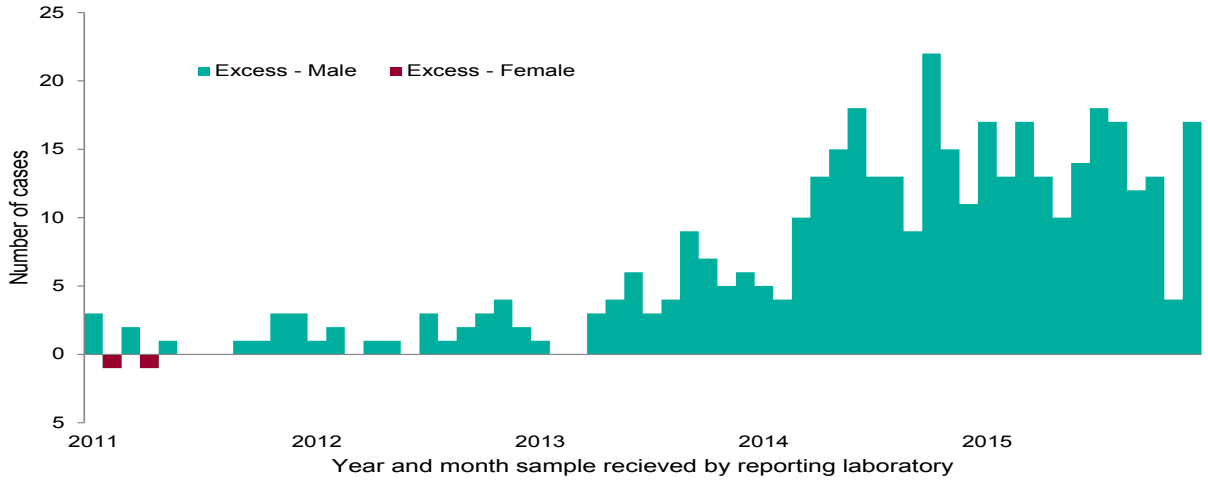


The travel status of 57% cases from 2011 to 2015 is not explicitly known which hampers the ability to interpret trends. The proportion of cases where travel status is unknown increased from 49% in 2011-2012 to 61% from 2013-2015. The number of *Shigella* cases known to be associated with foreign travel reduced by 16% from 101 cases in 2011 to 85 cases in 2015; no distinct trend can be seen in the data (Figure 1).

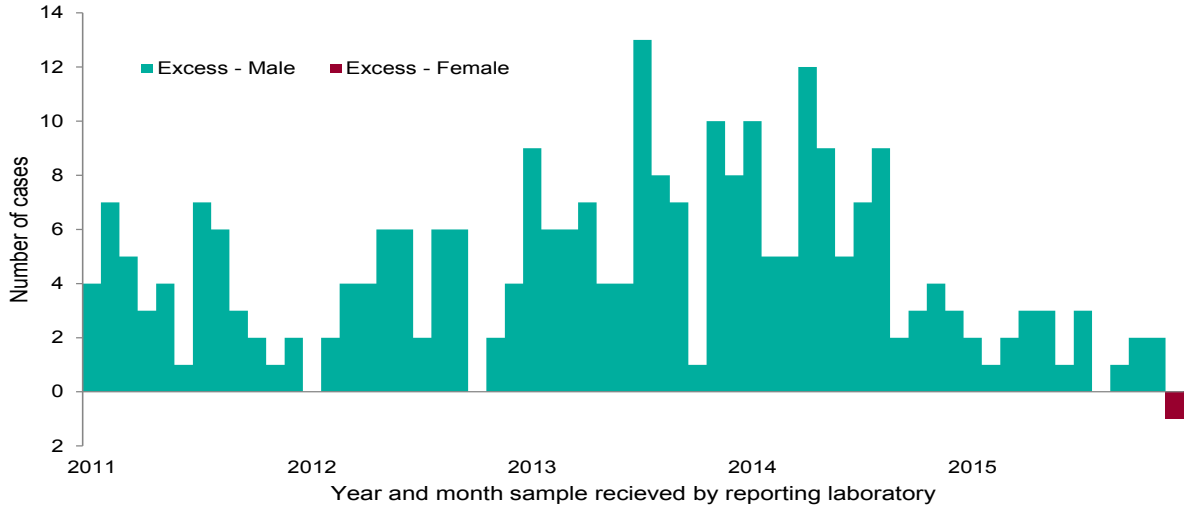
There was a decrease in male cases of *S. sonnei* in 2015 in those with no known foreign travel after a continuous increase from 2011 to 2014 (Figure 6). This trend is mirrored to a lesser extent in female cases. There was a sharp increase of male cases of *S. flexneri* 2a in males between 2013 and 2014, with a smaller increase from 2014 to 2015. There has been a sustained excess of male cases of *S. flexneri* 2a in 2015 (Figure 7).

Figure 7. Excess male and female cases aged 16 to 60 years with no known history of travel outside the UK, by sex, London, 2011 to 2015
Data source: Gastro Data Warehouse (GDW)

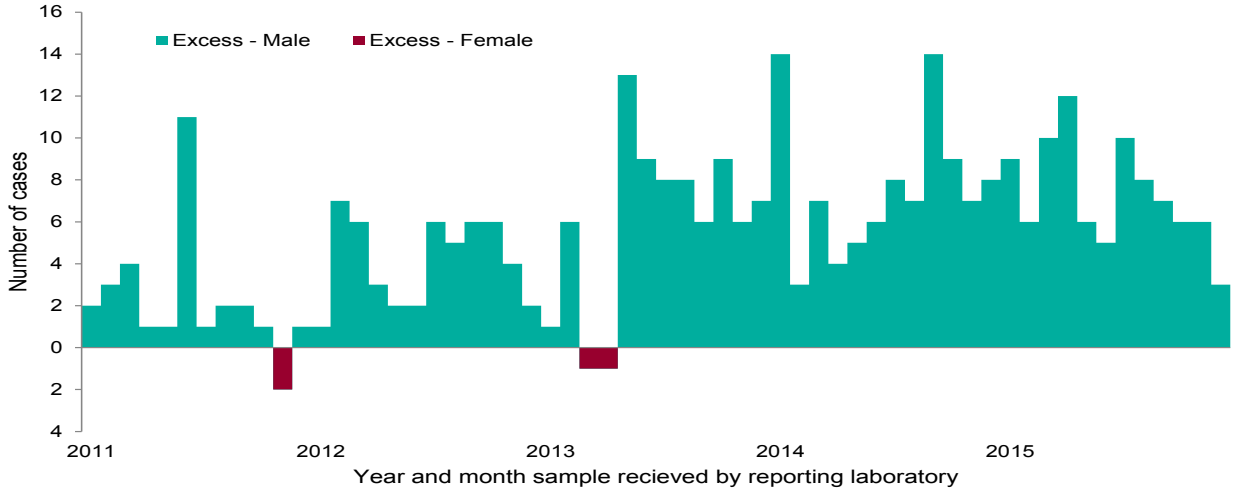
(A) *Shigella flexneri* 2a



(B) *Shigella flexneri* 3a



(C) *Shigella sonnei*



Breakdown by of cases with no known foreign travel by Health Protection Team

The epidemiology differs across different Health Protection Teams (HPTs) in London. The largest number of cases of *Shigella* with no known travel in those aged 16 to 60 years in 2015 was in North East and North Central London (NENCL), which comprised 50% of cases with no known travel (Figure 8). There has been an increase in the number of cases in all HPTs from 2011 to 2014, with a slight decrease in 2015. The increase is most dramatic in South East London (SEL) with a four-fold increase in cases from 2011 to 2015, while the number of cases doubled in South West London (SWL) and rose by 66% and 53% in North West London (NWL) and NENCL, respectively.

Figure 8. Cases aged 16 to 60 years diagnosed with *Shigella* infection with no known history of travel outside the UK, by Health Protection Team, London 2011 to 2015

Data source: Gastro Data Warehouse (GDW)

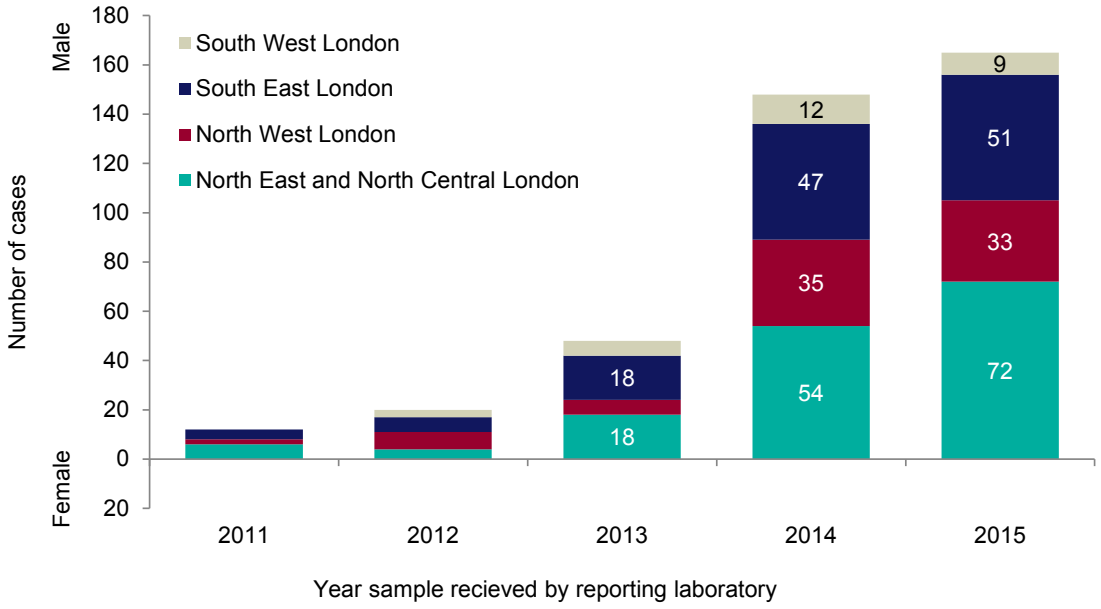
The number of excess male cases of *S. flexneri* 3a has decreased across all HPTs in 2015, while the number of excess male cases of *S. flexneri* 2a has increased across all HPTs from 2013 to 2015.

Cases of *S. sonnei* in men with no known travel have increased across all London HPTs from 2011 to 2014, with trends differing in 2015. The number of cases continued to increase in 2015 in SWL and NENCL (a three-fold increase and 11% increase, respectively), while numbers decreased in SEL and NWL (30% and 79%, respectively).

Figure 9. Excess male and female cases aged 16 to 60 years, with no reported history of travel outside the UK, by Health Protection Team, London, 2011 to 2015

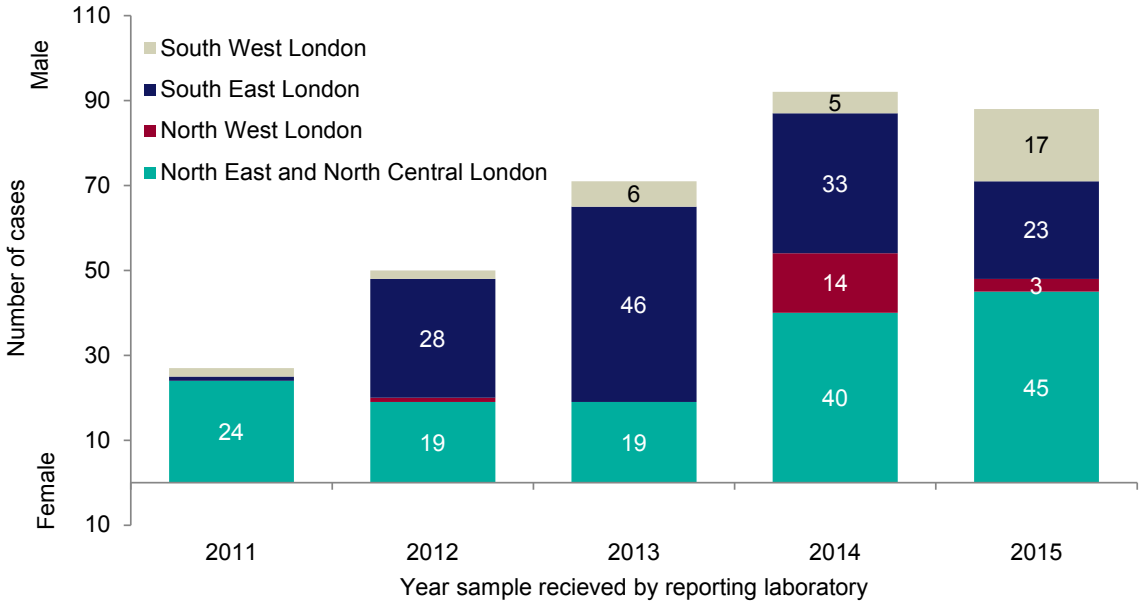
Data source: Gastro Data Warehouse (GDW)

(A) *Shigella flexneri* 2a



(B) *Shigella flexneri* 3a

(C) *Shigella sonnei*



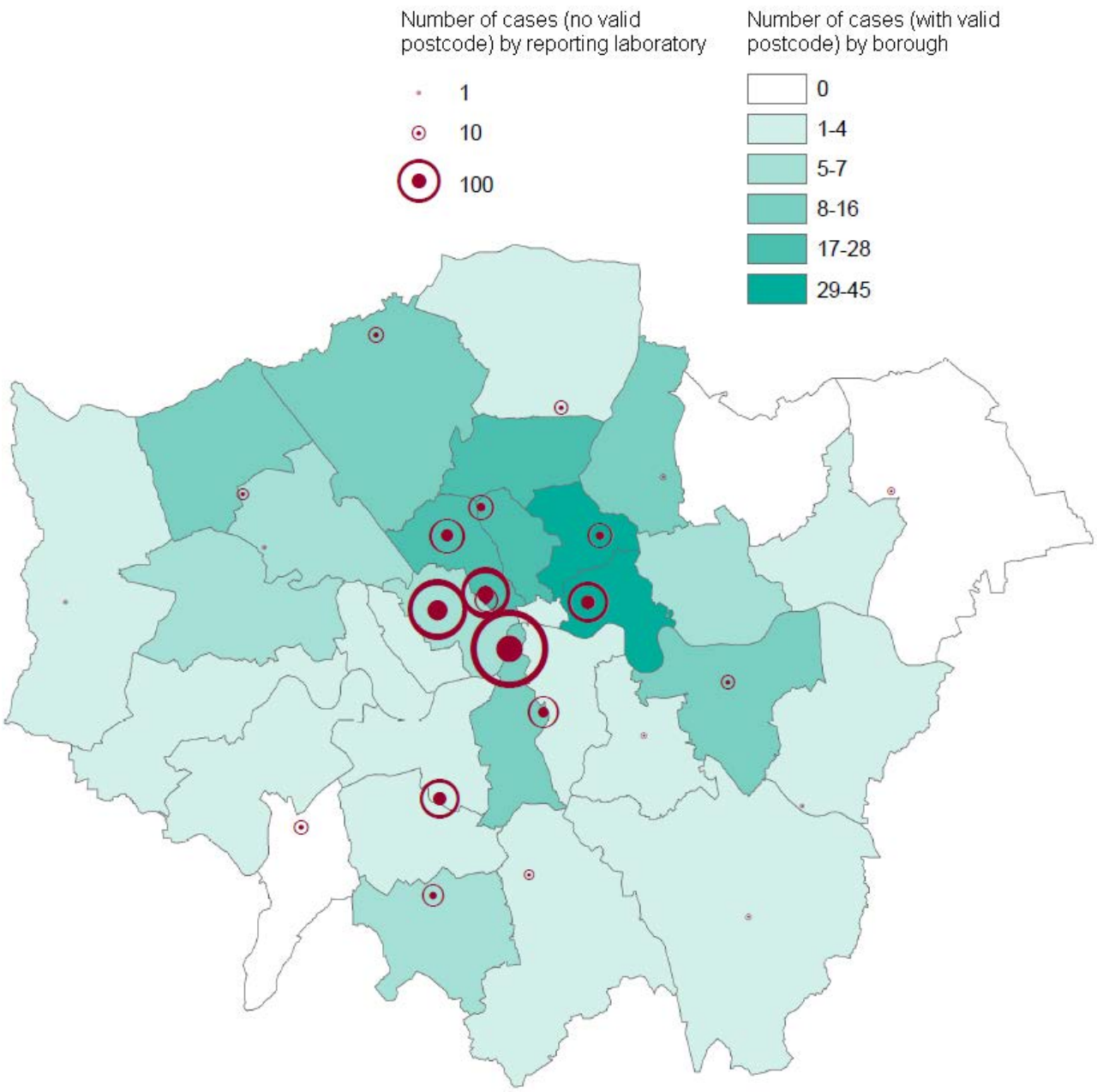
Breakdown by of male cases with no known foreign travel by local authority

The spread of adult male cases with no known travel history is displayed in Figure 10. Please note that 78% of male cases with no known foreign travel do not have valid postcode so their local authority of residence is unknown and they will be assigned to the laboratory of testing.

St. Thomas' Hospital laboratory reported the highest number of cases without a valid postcode (313 cases), with St Mary's Hospital laboratory (185 cases) and University College Hospital laboratory (124 cases) also reporting high numbers. Local authorities whose residents' specimens are processed by these laboratories will have a proportion of these cases.

Where residence information was known, Hackney had the highest number of cases of diagnosed *Shigella* infection among adult males with no known travel history (45 cases). Tower Hamlets (35 cases), Islington (28 cases) and Camden (21 cases) also report a large number of cases among those with valid postcodes.

Figure 10. Thematic map of male cases of diagnosed *Shigella* infection aged 16 to 60 years, with no reported history of travel outside the UK, by local authority of residence where known, OR by reporting laboratory where local authority of residence is unknown, London, 2011 to 2015
Data source: Gastro Data Warehouse (GDW)



Conclusion

After a continued rise of *Shigella* in London between 2011 and 2014, there has been a decrease in the number of cases diagnosed in 2015, due in part to a decrease in cases of *S. flexneri 3a* and *S. sonnei*. The number of cases in those with no known foreign travel has decreased in 2015, however for males without a known history of travel there has been a notable sustained rise in *S. flexneri* 2a. Male cases with no known foreign travel are concentrated most heavily in Central London but residence information is often not available. Better residence information would help better understand which geographical populations are most affected.

Despite a decrease in the total number of excess male cases of diagnosed *Shigella* in 2015, there is still a clear excess of adult male cases in those with no known foreign travel in London. Further work is needed to reduce transmission in this group by raising awareness among MSM at a national and local level, regarding how to prevent spread and the symptoms. This follows previous investigation of MSM cases which highlighted a low level of awareness. Materials are available on the PHE website for this purpose. Health protection teams and clinicians also need to take opportunities to provide information to cases on how to prevent further spread.

Appendix 1. Data management

1. **Data source:** Gastro Data Warehouse (GDW)

2. **Date data extracted:** Data extracted 22 January 2016

3. **Inclusion criteria:**
    a. Laboratory confirmed *Shigella* infection cases reported to GDW.
    b. Cases resident in London, if case residence unknown, original reporting laboratory in London.
    c. Cases with sample date between 01/01/2011 and 31/12/2015 (inclusive).
    d. Cases aged between 16 and 60 years.

4. **Exclusion criteria:**
    a. Records were de-duplicated based on forename and surname; if a given individual was reported more than once within a 14 day period the record with the earliest sample date was preserved and other records excluded.
    b. Records with missing date of birth were excluded.

5. **Modifications:**
    a. Sample receipt date was used if sample date was missing.

6. **Caveats:** Not all positive cultures are sent to the Gastrointestinal Bacteria Reference Unit (GBRU), therefore the data held in GDW is a subset of the true number of positive results reported in London. Cases where sex is unknown (n=31 from 2011 to 2015 among those with no known foreign travel) are excluded from figures and calculations when data is presented by sex.

References

1.Public Health England. Shigella: guidance, data and analysis. 2016.

2.Hawker J BH, Blair I, Reinitjes R, Weinberg J. Communicable Disease Control Handbook. 2nd ed: Blackwell Publishing Ltd; 2005.

3.Borg ML MA, Tostmann A, Gobin M, Cartwright J, Quigley C, Crook P, Boxall N, Paul J, Cheasty T, Gill N, Hughes G, Simms I, Oliver I. Ongoing outbreak of Shigella flexneri serotype 3a in men who have sex with men in England and Wales, data from 2009-2011. Eurosurveillance. 2012(17):13.

4.Gilbart VL SI, Gobin M, Oliver I, Hughes G. The Lancet 2013 High-risk drug practices associated with Shigella flexneri serotype 3a infections amongst men who have sex with men. The Lancet. 2013.

5.Simms I, Field N, Jenkins C, Childs T, Gilbart VL, Dallman TJ, et al. Intensified shigellosis epidemic associated with sexual transmission in men who have sex with men--Shigella flexneri and S. sonnei in England, 2004 to end of February 2015. Euro surveillance. 2015;20(15). Epub 2015/05/09.

6.Gilbart VL, Simms I, Jenkins C, Furegato M, Gobin M, Oliver I, et al. Sex, drugs and smart phone applications: findings from semistructured interviews with men who have sex with men diagnosed with Shigella flexneri 3a in England and Wales. Sexually transmitted infections. 2015. Epub 2015/04/30.

7.Public Health England. Cluster of Extended-spectrum beta-lactamases (ESBL) producing and macrolide resistant Shigella sonnei in men who have sex with men. (2015); Available from: www.bhiva.org/shigella-sonnei-in-MSM.aspx

8.Public Health England. 2013; Available from: www.gov.uk/government/publications/shigella-leaflet-and-poster

About Field Epidemiology Services

The Field Epidemiology Service (FES) supports Public Health England Centres and partner organisations through the application of epidemiological methods to inform public health action.

FES does this in two main ways, firstly by providing a flexible expert resource, available, as and when needed, to undertake epidemiological investigations for key health protection work and secondly through the expert analysis, interpretation and dissemination of surveillance information to PHE Centres, local health partners, service providers and commissioners of services.

Within the FES network, excellence and innovation is encouraged, we foster academic collaborations and take active part and lead in research, development and training.

You can contact your local FES team at fes.seal@phe.gov.uk

If you have any comments or feedback regarding this report or the FES service, please contact fes.seal@phe.gov.uk